

REPORT OF THE
DIRECTORS and CHIEF ENGINEER OF THE ST. JOHN and
QUEBEC RAILWAY
COMPANY.

For Year Ending March 15th. 1918

THE SAINT JOHN AND QUEBEC RAILWAY COMPANY
REPORT OF THE DIRECTORS AND CHIEF ENGINEER

May 10, 1917 — March 15, 1918.

To His Honour the Honourable William Pugsley, D. C. L., K. C.,
P. C., Lieutenant-Governor of the Province of New Brunswick.

May it Please Your Honour,—

The Directors of the Saint John and Quebec Railway Company beg leave to submit the following report:

The Saint John and Quebec Railway is completed between Centreville and Gagetown and the whole of the work has been paid for. The rights of way have been settled with the exception of sixteen cases, twelve of which are through the City of Fredericton and are being acquired by the Canadian Government Railways on behalf of our Company from the owners through the Exchequer Court under an arrangement between the former board of directors and the Government Railways. The cases have been heard, but judgments have not yet been given. Apart from these the total cost of the railway between Centreville and Gagetown has been \$4,495,544.11.

The Canadian Government Railways were provided with terminals at Fredericton, and it was not necessary that our Company should construct such facilities. An arrangement has been made for the use of the terminals jointly, and our Company has agreed to pay the interest at 6 per cent. per annum on half the cost of the same, amounting to \$22,012.48. The Government Railways were also provided with shops at Gibson which were quite sufficient to take care of the business of the Valley Railway, and in lieu of the building of shops we have arranged to pay 6 per cent. to the Dominion Government on \$60,000.00, which is the estimated cost of the same, so that from the 40 per cent. rental which is to be paid to us from the Dominion there is to be deducted each year the interest at 6

per cent. on \$82,012.48.

The Saint John and Quebec Railway has received from the Dominion Government the full subsidy granted in aid of this one hundred and twenty miles of railway between Centreville and Gagetown, and from the Prudential Trust Company that part of the trust fund applicable to this section.

The Railway is being operated by the Canadian Government Railways under an interim agreement pending the completion of other portions of the line and by such agreement the Dominion pays to this company 40 per cent. of the gross receipts received from the operation of the road. The following is a statement showing the amount paid covering a period from the 1st of April, 1915, when the operation began, up to the end of September, 1917, which is the Dominion Government's half-yearly period.

Months.	1915-1916	1916-1917	1917-1918
April	\$2,680.82	\$3,298.62	\$3,326.39
May	2,184.52	3,019.84	3,322.04
June	2,056.42	2,269.06	2,675.20
July	2,506.98	2,394.98	2,797.92
August	1,663.01	2,186.53	2,068.67
September	1,859.35	2,527.88	2,578.91
October	1,566.25	3,334.33	....
November	1,625.43	2,540.43	.....
December	2,416.71	2,626.04
January	2,195.96	2,519.08
February	2,357.38	2,342.39
March	2,995.73	3,471.03
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	\$26,108.56	\$32,530.21	\$16,769.13

Total, \$75,407.90.

The Railway between Gagetown and Westfield, which is referred to more particularly in the report of Mr. Foss, the Chief Engineer, and that of Mr. Phillips, the Divisional Engineer, both of which are submitted herewith, will, it is expected, be finished and ready for operation during the coming season. The estimated cost of this section is \$2,420,708.64.

The Province has received from the Dominion Government

on account of the subsidy granted in aid of the railway on the 37.9 miles between Gagetown and Westfield, the sum of \$116,-236.42, and when this portion of the road is finished there will be due from the Dominion an additional subsidy payment of \$126,413.09.

From the Prudential Trust Company there has been paid to the Province since the present board of directors were appointed the sum of \$80,957.58 on account of this section of the road. When we took charge we found that the Prudential Trust Company had advanced to the Saint John and Quebec Railway the sum of \$597,549.77 out of the trust fund over and above the amount properly applicable to the railway between Centreville and Gagetown, according to the terms of the trust mortgage, and this over-payment had to be adjusted by the construction between Gagetown and Westfield before any further moneys could be obtained. There will be due from the Trust Company as the work progresses on the Gagetown-Westfield section a further sum of \$169,627.12.

The Prudential Trust Company has in its hands in addition to the above mentioned sum or \$169,627.12, an amount approximating \$250,000.00, which by the terms of the Trust Mortgage was to be applied toward the cost of construction of the railway north of Centreville, and also the sum of about \$100,000 accrued interest on the fund created by the sale of the first mortgage bonds which is payable to the Province on behalf of the Railway Company. This interest money the Trust Company refuses to pay over under a claim that it has a right to retain it against a loan made by it to A. R. Gould and his associates in the year 1912.

This loan was originally some \$400,000.00 and it has been reduced from time to time by payments from the Saint John and Quebec Railway Company to the balance now claimed for principal and interest of \$116,000.00.

The undersigned expect to have some recommendation to make in the near future in respect to the collection of this interest money from the Trust Company, and also as to some provision whereby the money retained against the construction of the railway north of Centreville may be made available in reduction of the bonded indebtedness against the railway.

Your present Board of Directors has obtained a settlement of long outstanding account with the Canadian Government Railways in respect to which claims against the subsidy had been filed at Ottawa and the 40 per cent. rental above referred to had been retained by the Dominion Government. As a result of the settlement of the claims have been released, and the rental received by the Province, and it has been agreed that the rental in future shall be paid over at the end of every six months.

Two lawsuits against the Company are now pending; one before His Honour the Chief Justice of the King's Bench Division, in which William Henry Maxwell claims damages in respect to the moving of buildings from the right of way; and the other, in which interesting questions are likely to arise, is an action brought by the Bank of B. N. A. for \$120,000.00 as assignee of the claim of the Hibbard Company, Ltd., of Montreal, contractors, for the construction of the railway between Woodstock and Fredericton. In a settlement made by the former board of directors with the Hibbard Company, Ltd., the Bank of B. N. A. was not consulted. The former directors claimed that they had no knowledge of the alleged assignment of the Hibbard claim to the bank, and they paid moneys to certain claimants and the balance to the Hibbard Company itself. The Bank's contention is that notice of the assignment was given to the Hon. Mr. Landry, then Provincial Secretary-Treasurer, and also to the Railway Company, and that therefore the Railway Company had no right to settle directly with the Hibbard Company, Ltd., but should have settled with the Bank.

The Board of Directors is of opinion that with more efficient operation by the Canadian Government Railways of the section of the railway between Centreville and Gagetown, the gross income therefrom could be greatly augmented. The service is very inadequate. We realize that war conditions make matters difficult, but we feel that, even now, some improvement could be made if the management were disposed to give to the Saint John and Quebec Railway the same consideration and treatment accorded to the Government Railways as a whole. Very large quantities of freight are being offered to the line which cannot be transported owing to the scarcity of rolling stock and no adequate effort appears to be made to meet

competition from the Canadian Pacific Railway, which touches the Valley Railway territory at many points. No proper attempt seems to be made to keep the passenger cars clean nor to provide the stations with sufficient fuel so that they will afford protection to the travelling public in the winter season. These small matters might be attended to and certainly are not caused by war conditions. We are endeavoring to bring about an improvement in this service.

We have the honour to be, Sir,

Your obedient servants,

W. P. JONES, President.
C. O. FOSS, Chief Engineer.
E. S. CARTER, Secretary.

Fredericton, N. B., March 15, 1918.

REPORT OF THE CHIEF ENGINEER TO THE BOARD OF DIRECTORS.

When the present Board of Directors took charge of the Saint John and Quebec Railway on May 10, 1917, they found the section from Gagetown to Centreville, 120 miles, completed and under operation by the Canadian Government Railways. The section from Gagetown to Westfield, 37.8 miles, was under construction, about 40 per cent. of the work having been done, and the section from Centreville to Andover under contract. The Board at once took this contract under consideration, and it being the unanimous opinion of this board, as well as the Provincial Engineer, and every member of the Government, that under the conditions then existing, with the country engaged in a world war of indefinite duration and cost, with the probable difficulty of selling securities even at abnormal rates of interest, with the constantly increasing scarcity and cost of labor and the practical impossibility of obtaining rails and fastenings at any price, made it not only advisable, but obligatory to cancel this contract, and the same was cancelled by Order-in-Council on the recommendation of this board. After the cancellation of this contract, the board authorized the Chief Engineer to make a survey of the different routes in order to ascertain whether the route which had

been adopted and on which the contract had been let was the best obtainable, in case it should be decided to go on with this construction at some future date, when conditions have become normal again. As the result of this survey, the Chief Engineer reported that he had been able to locate a line so far superior to that which had been put under contract that the two are not in the same class. Briefly: the new line is two thirds of a mile shorter than the old, has 932 degrees less curvature, cuts out 22 curves entirely, reduces maximum curvature from 7 degrees to 6, which was Transcontinental standard, reduces rise and fall on maximum grades 200 feet and would save many thousand dollars in construction cost.

The capitalized value of the savings shown above being dependent on the cost of operation, which has greatly increased since the value tables were compiled, make it difficult to place correct present value on such savings, but even if based on the old tables, would represent, for say four daily trains, a saving that would construct several miles of road at average cost per mile. When the time comes that the construction of this section can be undertaken, the purchase of right of way can be completed before construction is begun, which is very desirable.

Regarding the section from Gagetown to Westfield, as stated at the outset, this was well under way, so that no changes could be made. The nature of the country through which this part of the road is being built is such as makes a low grade road very expensive, as there is very little level land along the river, the ground for the most part rising quickly from the river. The first item of cost in the construction of a railway is for the land, commonly called the right of way. In this case the cost has been very high for several reasons:

First, the land has been so sub-divided that there are 277 parcels of land in the 37.82 miles, being an average of seven farms or lots per mile. As these farms and lots for the most part abut on the river, the railway either cuts off the water front entirely, or, if leaving a part of the land below, caused serious severance damage. As the highway along the river occupied the ground which in many places the railway had to have, it was necessary to build four and a half miles of new

highway, and as all this new highway had to be built on far more difficult ground than it originally was built on, this, coupled with the fact that the Provincial Engineer has insisted on the new road being built up to much higher standard than the old road had been, made this item very expensive, far exceeding the original estimates. As the buildings were for the most part situated near the highway, it was found necessary to move forty buildings of all kinds, and five of them the company had to buy outright.

In making agreements for right of way, the quite common mistake was made of screwing the owner down to the least possible price, which in many cases was manifestly insufficient and unjust. The result was as always, when the construction was begun and many owners realized the inconvenience and damage they were going to be subject to, they sought, and usually found, some excuse for refusing to execute their deeds unless they were given more money than was named in the agreement. Then the preceding board swung to the other extreme and paid, or agreed to pay, considerably more in some cases than, in the judgment of this board, they should have. The natural result of this was that others near by who had not executed their deeds demanded that they get as much in proportion as their neighbors. Many of the agreements were made before the final refinement of the location, with the result that whenever the line was moved a few feet from the ground on which it was staked at the time the agreement was made, many of the owners made this an excuse for refusing to carry out the agreement, and demanded more money.

Another item of considerable expense in connection with right of way is due to the necessity of providing water supply where wells have been destroyed or springs cut off and dried up in the course of the grading. In most of these cases it has been necessary to drill deep wells. There have already been seven of these wells drilled, which average considerably over a hundred feet in depth, and there is one just finished at Oak Point three hundred and two feet deep.

Still another considerable item of expense in connection with right of way is the moving of telephone lines. The total cost of land purchased, damage to adjoining land, construction

of new highway, purchase and moving of buildings, moving of telephone lines and water supply, has already cost \$191,153.00 and will require \$20,000 to complete, or complete, or a total of \$5,442 per mile.

Grading.

The largest item of cost in the construction of a railway is the grading and this varies very widely as between solid rock and sand or gravel. The material to be moved in grading is divided into two, three or four classes—in very rare cases two classes, solid rock and all other material; often into three classes, solid rock, loose rock and common excavation; or solid rock, loose rock and all other material; and sometimes into four classes, solid rock, loose rock, hard pan and common excavation. As nearly always, the Engineer in estimating the cost of grading has nothing to guide his judgment except the surface indications, and he is very liable to be a long way astray from the actual nature of the material, as shown when the excavations have been made. Just in this connection perhaps we may be pardoned for digressing to state that engineers as a class are optimists, nearly always being inclined to underestimate the difficulties which they cannot clearly foresee, and it is probably better so than if they were too pessimistic, in which case many necessary undertakings would be long delayed or totally abandoned if the final cost was known from the outset. In this case the grading material is divided into three classes: solid rock, loose rock and all other material, and the prices are respectively, 1.55, \$0.65 and \$0.40. If at the outset before any excavation had been made the engineer had estimated 200,000 yards as other material, which turned out to be loose rock, this would have increased the cost of grading \$50,000 over the estimate, and if he had estimated 100,000 yards of loose rock which turned out to be solid rock, it would have increased the cost \$90,000 over the estimate, or a total of \$140,000 in the item of grading, and this might easily happen. So far as can be ascertained, no original estimate was made before construction was begun, but on the 27th of March, after construction had been under way for nine months, the engineer reported to the President that the estimated cost of grading, including highway and stream diversions, would be \$907,265.05. Of this there had then been sent \$437,378.25,

or nearly half of the total estimated cost. Up to December 31st, grading has cost \$1,019,645.68, or \$112,380.63 more than the total estimate made in March, and we estimate that it will still require \$178,380.00 to complete, or in round numbers, \$290,000 more than was estimated in March. A very large amount of rip-rap is required to protect the banks against the encroachments of the St. John river in times of high water, and although this has been treated as a separate item, it is really a part of grading. This was estimated in March to cost \$74,701.50, of which about 12 per cent. was done. The cost of this item to December 31st is \$53,519.11, and we estimate that it will still cost \$70,000.00, a total of \$123,519.71, or \$48,818.21 more than estimated in March. Add to this the \$290,000, and we have a difference of over \$344,000 between the work done and estimated in March, and the work done and estimated in December.

Bridges and Foundations.

The bridges stand as estimated in March, with an additional 75 foot span over the westerly channel of the Nerepis, which this board deemed it advisable to put in in order to provide more water and accommodate the requirements of lumbermen having logs to be taken through.

The item of bridge construction which has proved very expensive and has much exceeded the estimate, is foundations. None of the streams crossed are of any considerable size, but the road crosses them close to their junction with the St. John and each one forms a settling basin into which not only is the material brought down by the stream itself deposited, but probably more or less from the main river, with the result that the excavation for foundations has to go deep and at big expense.

The contract states that when foundations are deeper than 15 feet below the water surface, special arrangements will be made for each particular case. The arrangement that was made was to pay cost plus 10 per cent., although the Nova Scotia Construction Company are said to have offered to do the work for \$4 per yard, which of course looks very large, but as we know today would have been much cheaper. In March the estimate for bridge substruction, including foundations, was

\$121,754.00. The expenditure to December 31st is \$261,-107.34, a difference of \$139,353.34, and we estimate \$48,000 more to complete, making a total difference of over \$187,000 which, added to the difference in grading cost, makes an increase of \$531,000 over the March estimate.

Appended hereto is an exhaustive report by the Divisional Engineer, Herbert Phillips, giving the cost of each structure in detail, and showing the various causes which have increased the cost beyond the estimates and which could not have reasonably been foreseen at the time estimates were made.

Saint John and Quebec Railway—District "A."

Divisional Office, Oak Point, N. B.,

February 1, 1918.

C. O. Foss, Esq., Chief Engineer, Fredericton, N. B.

Re Bridges

Dear Sir,—Of the nine bridges on this Division, the sub-structures have been completed for seven and the work on the remaining two is well forward, so that all will be ready for the superstructures next month.

While we have met with no serious difficulties or misfortunes, such as frequently attend work of this sort, it has, in every case, been a somewhat difficult and expensive business to obtain safe foundations for these structures.

In no part of our work has the greatly increased cost and scarcity of labor and supplies been so keenly felt as in the bridge work. The large amount of plant and equipment required for this work and the consequent heavy standing charges make delays due to shortage of labor particularly costly. At no time during the past year have we been sufficiently well manned to get the full efficiency out of the plant in use. The conditions under which the work has been performed have thrown the whole of this additional expense on the Railway.

Clause 51 of the specifications attached to the Nova Scotia Construction Company's contract provides:

"When foundations are deeper than 15 feet below the

“water surface, special arrangements will be made for each particular case,”

And with one exception all our bridge foundations fall in this class.

On January 4th, 1916, Mr. Ross Thompson instructed me: “This Company has arranged with the Nova Scotia Construction Company to pay for all foundations over fifteen feet below water level (Section 51 of the Specifications) as extra work, in accordance with clauses 9 and 10 of the Contract, and in addition to pay a rental, at a reasonable rate, for the machinery employed in such foundations. This rental is not subject to the 10 per cent. addition.”

We have been fortunate in that the bulk of this work was sub-let to efficient and experienced contractors well equipped for the work. Both Powers & Brewer and Lynch, Peckham and Gorman are bridge builders of known ability and integrity, and the fact that the cost of these foundations has far exceeded our anticipations is due to causes entirely beyond our control, and in spite of their loyal and persistent efforts to carry on the work as economically as is consistent with good workmanship and recognized methods.

Referring back to a pay roll for a typical bridge gang of 31 men employed during the winter of 1914-15, I find that their combined wages were \$70.25 per day. A similar gang now costs \$100.75, an increase of 43.4 per cent.

For supplies the increase is still more marked. Six staple articles which enter largely into this work, round iron, washers, nuts, spikes, and wire and manila rope, show increases ranging from 121 per cent. to 255 per cent., and a mean increase of 175 per cent., while the increases in the price of coal and lumber during the past year make a big proportion of our costs.

Out of 22 structures, 14 are carried on pile foundations and 972 piles having an aggregate length of 30043 lineal feet, have been driven. Our sub-aqueous excavation totals 15092 cubic yards, and 637,000 fbm of timber has been used in the cofferdams.

The total cost of foundation work will amount to \$157,-

592. of which about \$33,000 is due from the Department of Public Works for work done on the Nerepis bridges, leaving \$124,592 as the net cost of the Railway work.

We shall use in abutments and piers 13,151 cubic yards of concrete which will cost \$124,387, of which about \$25,200 will be the Highway Department's share, leaving \$99,187, so that the total cost to the Railway for sub-structures for the nine bridges will amount to \$224,779.

Following is a description and statement of the cost of each structure:

Burgess Lake, Mile 34.8

The mouth of Burgess Lake, near Fox's wharf, is to be spanned by a 35 ft. through plate girder carried on U type concrete abutments.

The land at the mouth of the lake, or bog, is formed of soft clayey silt of gradually increasing density as you go down, and our test piles, driven to a depth of over 40 feet indicated that the bridge could be safely carried on a pile foundation. In view of the very soft character of the top 10 feet or so of the clay, it was felt that the piles might lack lateral support, and to meet this contingency and secure an ample margin of safety, your instruction that the two sets of piles should be securely tied together at the top is being carried out.

To secure safety from scour, the excavation has been carried to a depth of about eight feet below the bed of the brook, a total depth of 16 feet below the present water level.

This work was first laid out on September 29th, 1916, and the sub-contractors, the Bedford Construction Company, were urged to put it in hand immediately. After looking over the situation, however, and discovering that to prepare these foundations was a considerable job, requiring the use of plant and organization which they did not have readily available, they decided to defer the work to a later date and constructed a temporary structure supported on cribs over which they have carried out their grading operations.

This delay has caused a very heavy increase in the cost of the structure. The cofferdam, excavation and pile-driving,

which will now cost about \$12,000, would certainly not have cost more than \$8,000 if the work had been done last winter.

The B. C. fir, of which the cofferdam is constructed, is costing \$62.50 per M in St. John. Similar material obtained as recently as March, 1917, for our work at Nerepis River cost only \$45. The wages of ordinary labor has increased from \$2.25 per day to \$3, and the increased cost of skilled labor is still greater. Coal obtained last winter for \$5.50 per ton now costs \$8.50. These items alone account for a difference of from \$3,000 to \$4,000.

The base of the temporary structure, which was found to have settled over 12 feet into the mud, has also been a source of some delay and expense, the extent of which it is hard to estimate.

That this additional cost falls wholly on the Railway is due to the conditions of the agreement made with the Nova Scotia Construction Company on January 4th.

The work has been sub-let by the Bedford Construction Company to Messrs. Lynch, Peckham and Gorman, who commenced operations on Oct. 30th last.

A cofferdam of 6 in. grooved and splined sheet piling has been driven, and 970 cubic yards of mud excavation from the area enclosed.

98 bearing piles, penetrating 30 feet into clay, have been driven, and the concrete work will be commenced in the course of a few days.

Unless any delay is caused through the seizure of coal now in transit by the Can. Govt. Railways, we anticipate that the work will be completed and ready for the superstructure by March 1st.

The total cost of substructure will be \$18,000.

Otnabog Lake, Mile 39.7.

This bridge has three spans, two 50 ft. shallow deck plate girders, and a central 60 ft. through span. The abutments are submerged.

The south abutment is founded on hard red clay at a depth

of 18 feet below the surface of the water, and the south pier on the same material at a depth of 21 feet. We did not reach this hard material for the north pier and abutment, and these two structures rest on piles 35 feet long and cut off at a depth of 24 feet for the pier and 22 feet for the abutment.

The foundation work, and the erection of the sub-structure was let to Lynch, Peckham & Gorman, who commenced work on November 21st, 1916.

Open caissons for the abutments measured 18x 4 feet and for the piers 13x45 feet, and 109,890 fbm of lumber entered into them.

Every effort was made to push this work, but at no time had the contractors as many men as could have been employed on the work, whilst towards the end of the winter this shortage became serious.

As a result, the work was not completed when in April the spring freshet compelled us to abandon the job. As conditions have been for the past year, every month's delay appreciably increases the cost of doing work of this kind, and in this case the increased cost over our estimates is mainly due to this cause. We also found that some heavy lumber scows brought out of the lake in the spring, becoming unmanageable in the swift current at the bridge site, had run into and "sprung" the pier caissons so that they had to be repaired before they could be pumped out. The cost of the caissons, excavation, pumping and bearing piles comes to \$16,169.93, and the total cost of substructures to \$29,813.

Little River, Mile 43.6

Soundings taken at our crossing of Little River revealed nothing more substantial than soft mud down to a depth of over 30 feet below the water; but in this case it was practicable to divert the stream to a location where the foundations for the bridge could be placed on a hard clay foundation.

To place our footing course below the bed of the brook it was necessary to dig pits to a depth of 17½ feet below the level of the ground and to excavate 844 cubic yards of clay.

For shoring and bracing the sides of excavations 35,000 fbm. of lumber was used.

Work was commenced on April 20th, 1917, by Messrs. Lynch, Peckham and Gorman, and completed at the end of August, no special difficulties being encountered.

100 short piles, having a total length of 1,500 feet, were driven.

The total cost of excavation, shoring and bearing piles came to \$6,439.89, and with the concrete the total cost of sub-structure comes to \$11,000.

The stream diversion came to \$2,727.11.

Little Jones Creek, Mile 47.8

This inconsiderable stream flows through a marsh or swamp in which the mud is about 20 feet deep.

An opening of 12 feet would provide plenty of waterway, and it was originally intended to use a rail-top culvert, but on March 29th, 1917, we were instructed to arrange for a 35 ft. span, so as to allow during high water for the passage of rafts of logs and scows with lumber to and from a mill situated above our line. Any diversion of this brook would have entailed considerable dredging operations, probably costing much more than could have been saved on the foundation work, although this has proved to be quite difficult and expensive.

The formation under the mud is of extremely hard clay and huge granite boulders, and our U abutments have been founded on this.

A considerable amount of false work was necessary to get at this job, and the transportation of plant, supplies, coal, lumber, etc., to the site was a big item.

The work was let to Messrs. Powers & Brewer, who commenced on August 14th last, and it has just been completed. The full effect of the steadily increasing cost of labor and supplies is clearly shown, notwithstanding the skill and experience which these contractors bring to the work, and the due regard to economy with which their operations are conducted.

Cofferdams, each 32½ ft. by 25 ft., of 6 inch B. C. fir, were

driven, and for the north abutment the bottom of the footing course is 21 1/2 ft. below the water level. The south abutment is founded at a depth of 19 feet.

69,500 fbm of lumber entered into these dams, and nearly two tons of iron, drift bolts, spikes, etc.

Altogether the falsework, cofferdams, excavation and pumping has cost \$16,591.82, and the concrete \$8,748, bringing the whole cost of sub-structure to \$25,339.82.

Marley Creek, Mile 56.1.

This is a 40 ft. T. P. G. bridge, with winged abutments, founded on piles driven 30 ft. into clay.

It forms part of the sub-contract of Smith & Merrithew, and the work was again sub-let to Mr. Charles Johnson. The whole of the foundation work was carried out during the period of extreme low water in the summer of 1916, and as during that time the maximum depth from water level to the bottom of footings was only 10 feet, it has been paid for at schedule rates.

A light cofferdam of 2 in. lumber, banked on the outside with clay, proved efficient, and the excavation was kept dry by one 4 in. steam pump.

The total cost of the work exceeded considerably the schedule prices, the loss falling on the sub-sub-contractor. 336 cubic yards were excavated from the cofferdams, and 3,510 lin. ft. of piling driven, at a cost to the railway for foundation work of \$1,967.70.

587 cub. yards of concrete went into the abutments, bringing the cost of the sub-structure to the Railway to \$7,250.70.

Jones Creek, Mile 57.

Soundings and test piles at this bridge site showed 15 feet of water (at low water) on a bed of soft clay and fine sand. This silt was very soft at the top, but at a depth of about 25 feet seemed to show body enough to provide lateral support for piling.

Authority to undertake this work was received from the

Dominion Public Works Dept. on December 27, 1916, but a few days delay occurred in starting operations owing to objections raised by the Bridge Department of the Canadian Government Railways to our plans. The contractor was allowed to proceed with the work on Jan. 12th, 1917.

The sub-contractors on this section, Smith & Merrithew, were not experienced in work of this kind, nor had they any plant suitable, but after some little friction we induced them to employ Mr. Chas. Johnson as superintendent of the work, and whilst from time to time some delays were caused through insufficiency of plant, on the whole the contractors did their best to remedy this defect. Much more serious, however, was the great shortage of labor which was constant throughout the job, and always seemed at its worst when there was some special need for haste.

Excavation was carried to a depth of 26½ feet below winter water level, and piles from 40 to 45 feet long were then driven their full length.

The type of cofferdam used was a double row of sheet piling driven 3½ feet apart, with the interval filled with clay puddle. The inside row of sheeting was of 4 in. spruce driven to about 3 feet below the proposed bottom of concrete, and the outer row of 3 in. stuff was driven two or three feet into the ground. This structure was, perhaps, a little light for its purpose, but when making our plans we had counted on a quick job, and I am satisfied that with a normal labor supply its promised economy of construction would have been fully realized.

As it was, the dam gave perfect satisfaction, until in March some warm weather thawed the puddle which had been placed during extremely cold weather in February.

From this until we were flooded out by the spring freshet about April 20, we were troubled with leaks, and it was necessary to keep the two 6 in. centrifugal pumps working most of the time. When the work was resumed on July 16th, and the subsidence of the puddle wall had been made good, we had no further trouble of this kind. The inside dimensions of cofferdams were 38 ft by 28 ft., using 66,300 fbm of lumber, and the total excavation came to 2,365 cubic yards. 7,763 lineal feet of piling was driven and the whole cost of foundation work:

was \$19,010.41. The two abutments contain 1,435 cu. yards of concrete and 2,304 lbs. of reinforcing iron, and cost \$13,054.14, bringing the total cost of the sub-structure to \$32,064.55.

Devil's Back Creek Bridge, Mile 65.5

This work is on Kennedy and McDonald's sub-contract, and in common with all their concrete work was let to Mr. A. Clark of St. John.

These contractors were ready to commence work on October 21, 1916, and after selecting the sites for the abutments I instructed the Resident Engineer to lay out the work, and at the same time to verify the information he had previously obtained respecting the nature of the bottom.

The work was laid out on October 28th, and on the 29th. Mr. Lemont reported that he had found at the South abutment 4 ft. of water, 2 ft. of mud, and 2 ft. of sand and gravel to solid rock. At the North abutment he reported 7 1/2 ft. of water, 1 1-2 ft. of mud and 3 1-2 ft. of sand and gravel to the rock. A foundation plan was prepared on this information and the contractor instructed to proceed with the work. Mr. Roy V. Smith was in charge of the work for the contractor and he brought to the job a considerable amount of plant, some of which was sadly out of repair, and most of which had seen so much service as to require complete renewal during the progress of the work. As foundation work of less than 15 ft. below the water level is covered by unit prices in the Contract we were only mildly interested in Mr. Smith's equipment and methods. Both Mr. Smith and his methods are ambitious. He went at this job as though it was going to cost a lot of money, and it did. Plant and materials were towed from St. John by motor boats, and during the month of November this bridge site was the scene of great activity.

Numerous motor boats, a toy tramway and a distributing tower about 40 ft. high were the outstanding features, while, probably owing to the irregular habits of motor boats, the work was often carried on during the night by the light of gasoline torches. But at the end of the month he received no estimate because no work which we could pay for had been performed.

During the month of December, 6 in. Wakefield sheet piling

was manufactured from 2 in. planks nailed together. This was set up around the edge of the proposed excavation and tapped as far as it would go easily into the ground. Mr. Smith explained that his piling would not stand punishment and that he intended to drive it on down as the excavation proceeded.

He then started dredging operations.

On December 29th. it was reported to me that at some spots the excavation had been carried down below the elevation at which rock was supposed to exist.

I at once visited the site and discovered that the material on which the sounding rod had fetched up was not rock but a submerged birch log. The whole bottom was full of such logs and I found that it would be necessary to carry the foundations down about six ft. farther than we had figured on to a clay hard-pan.

The cofferdam was in bad shape. In some places the excavation had been carried below the bottom of the sheeting and the whole back of the dam was sloping steeply towards the centre. To meet this contingency I instructed the Contractor to drive another row of sheeting behind these slanting ones, thereby widening the base of our structure. This would also bring our work more nearly into conformity with the latest design of bridge abutments adopted by the Canadian Government Railways (This bridge had been originally laid out according to the old S. J. & Q. standards since condemned by the Bridge Dept. at Moncton). Mr. Smith ascribes all the subsequent misfortune encountered on the job to this change of plan.

I at once reported the changed conditions to Mr. Ross Thompson, at the same time urging that steps be taken to compel Kennedy and McDonald either to take this work into their own hands or to provide competent superintendence. I also drew attention to the probable consequences if the Clark-Smith outfit (Mr. Smith now seemed to have some kind of partnership in the business) were allowed to retain the contract for the Nerepis Bridge. Mr. Thompson had several interviews with Mr. Kennedy on the matter, but it was some three weeks before any definite action was taken by the latter. On January 27th. 1917 Mr. Thompson wrote me from St. John.

"An arrangement has been made whereby Clarke as-

signs his contract back to the Kennedy and McDonald who will give Mr. Roy Smith a direct contract for the completion of the Devil's Back Bridge only and they are to arrange a contract tomorrow with either Powers and Brewer or the Engineering and Contracting Co. to build the Nerepis Bridge, the work to be started there immediately, farther the Railway Company is to engage a foreman or superintendent on the foundations of the Devil's Back Bridge—for which Smith is to furnish the necessary plant and labor on a cost plus 10 per cent. basis.

“I am arranging to get a suitable man for this job who will have complete control of that work and will advise you when he is to report. Smith is to prepare a correct statement of the cost to date which he is to take up with you before the end of this month and in time to be included in the estimates for January.”

The cost of the work to January 31st. as prepared by Mr. Smith came to \$10081.97. But this statement contained a good many items which we could not accept as the actual cost of the work, such as \$2,740 for plant rental; \$750 for Mr. Smith's own salary for 3 months; an expense account of \$486.18 and an item which Mr. Smith called “development” and which he explained took care of all expenses which could not be distributed to anything else. When I got it finally dressed down there remained \$5911.40 of the amount for which we were liable, and this is the amount that has been paid.

Early in February Mr. Kenneth McLaggan was sent in as Superintendent for the Company, but with Mr. Smith remaining on the job, this arrangement did not work out very well, and after three weeks trial I allowed Mr. McLaggan, at his own request, to go.

About the end of February we finally got the excavation for the South abutment down to hard-pan, but the cofferdam was in such bad shape that we were unable to pump it out, and had to fill up the whole thing with concrete to the top of the water.

The solitary real difficulty encountered at this job was the presence of submerged logs, but a similar condition was

being met both at Jones Creek and at the Nerepis River, and being handled with care and skill on the part of the Superintendents, was causing no serious inconvenience. Mr. Smith said that if we would allow him to use the same type of dam for the North abutment as was being used at the Nerepis he was sure that he could get as favorable results, so we went ahead on these lines, but with no better results.

During this period I repeatedly appealed to Headquarters, to Mr. Cozzolino, and to Mr. Kennedy to have this work taken from Smith, but the main Contractors were neither making nor losing anything on the job, and so were indifferent, while at Headquarters I was censured for inability to get results from the outfit on the job.

We did not get down to hard-pan until July and then only to find that the dam would not pump out.

The total cost of these foundations, including the quantity of concrete wasted in filling up the dams comes to \$25,845, and the total cost of sub-structure to \$33,493.82.

I am of course responsible for the error in our original soundings, and for any extra cost due to the consequent change of plans, but I feel that had drastic measures been taken at Headquarters to get this work as well as the Nerepis handed over to experienced Bridge Contractors at least \$10,000 would have been saved.

Nerepis River, Mile 69.4

The Main channel of the Nerepis River is to be spanned by two 50 ft. shallow deck plate girders, and a 60 ft. through bridge.

Authorization for the work was obtained from The Dominion Public Works Department on Dec. 1st, 1916, and as it was felt to be of the greatest importance to get this work done quickly, so as to avoid, as far as possible, interference with the grading operations, which at this point are very heavy, the Contractors were urged to put it in hand at once. Final plans were given to the Contractors on December 16th. They were notified that work of such importance could not be left in the hands of Clarke and Smith, to whom the work had been sublet by Kennedy and McDonald, and who

certainly had not sufficient plant, and did not appear to have the experience and capital necessary to get the work done in reasonable time.

It was not until January 24th. that Mr. Kennedy could be induced to cancel his arrangements with this outfit, and it was still a week later before he completed his arrangements with Powers and Brewer.

This delay has had serious consequences. Apart altogether from the additional expense incurred in the actual foundation work due to the earlier stage of the work at which high water was encountered; the necessity for taking care of navigation while work was actually under way, and the steadily advancing increase in the cost of all labor and supplies; this delay in starting was the direct cause of a six weeks tie-up of the grading sub-contractors, resulting in a loss to them of from six to seven thousand dollars; and the cost of false-works we were compelled to build to avoid further delay to the grading and consequently to the completion of the Railway, exceeds \$4600.

It was arranged with the Provincial Public Works Department to construct the abutments and piers for this bridge wide enough to allow for a highway alongside the Railway, and this has been done.

The cofferdams for the abutments measured 37 1-2 X 45 1-2, and were constructed of 6" B.C. fir sheet piling 35 ft. long, and the dams for the piers measured 59 ft. X 13 ft. The structures are supported on piles driven 30 feet into fairly stiff clay, and cut off at a depth of 26 1-2 ft. below the water line. From 18 to 22 ft of mud had to be excavated to get a safe bearing.

198000 fbm of lumber was used in the dams.

The total cost of foundations comes to	\$60500.
out of which the P. W. D. share comes to	24500.
	<hr/>
leaving the cost to the Railway	36000.
Adding our share of the cost of masonry	22985.
	<hr/>
Total cost of Railway substructure	\$58985

Nerepis Western Channel, Mile 69.6

The substructure for this 75 ft span is in course of con-

struction. The bottom has been dredged down 60 hard material and open caissons each 47' X 30' have been sunk to a depth of 22 ft, and will be ready for sealing in the course of a few days.

This bridge is also being constructed wide enough to accomodate the highway as well as the Railway.

Our share of the cost of the Foundation work will come to about \$18000, and of the concrete to about \$13300.

The work is being energetically prosecuted and should be completed and ready for the superstructure in March.

Yours faithfully,

(Sgd.) Herbert Phillips

Divisional Engineer.

The next item in the order of importance are Rails and Fastenings. When the contract was made with the Nova Scotia Construction Company on the 19th day of May, 1916 Rails were included at a price of \$48 per ton but there was a special provision added to the contract to the effect that the Railway Company might supply Rails and Fastenings if they should so elect within a given time. Soon afterwards Mr. Gutelius, the then General Manager of the Canadian Government Railways, offered to supply 80 lb. relay rails, that is, rails which the Maintenance department of the C. G. Railways have replaced with new rails under the heavy traffic and high speed on their main line, for \$31.50 per ton, as shown by the following letter:

Moncton, N. B., June 20th., 1916.

F. W. Sumner Esq., President, St. John and Quebec
Railway Company, Moncton, N. B.

Dear Sir: With reference to the rails for the St. John and Quebec Railway for the line between Gagetown and Westfield.

This is to confirm our arrangement that these railways will supply relaying 80 pound rails and angle bars for that purpose and will charge you \$31.50 per ton, delivered at Gagetown or St. John, as you desire, applied on the subsidy.

We should have no difficulty in supplying these rails to you as required, although it is desirable that you advise the dates that shipments should start.

Yours truly,

(Sgd.) F. P. Gutelius.

This offer was promptly accepted as shown by the following letter:

Tuesday, July 18th, 1916.

Mr. F. P. Gutelius, General Manager, C. G. R.,
Moncton, N. B.

Dear Sir: Referring to your favor under date of June 20th: Note you will supply eighty pound relay rails and angle bars delivered f. o. b. cars Gagetown or St. John, N. B., at Thirty one dollars and fifty cents (\$31.50) per gross ton, as required; quantity approximately five thousand tons. The St. John and Quebec Railway Co. are pleased to agree to this.

It is quite agreeable to have the account for same deducted from or charged against the St. John & Quebec Railway Co. subsidy.

Yours truly,

(Sgd.) F. W. Sumner,

Pres. St. John & Quebec Ry. Co.

Under this agreement 1,284 tons of Rails and Fastenings were delivered between the months of August and December 1916.

On April 2nd, 1917 Mr. Gutelius wrote two letters, copies of which are herein embodied and which fully explain why the delivery of rails by the C. G. Railways was discontinued for the time being.

Moncton, N. B., April 2, 1917.

F. W. Sumner, Esq., Moncton, N. B.

Dear Sir: I have your letter of March 24th, suggesting that we secure the rails which are now on the Seaboard Railway.

We may be compelled to undertake some such drastic action to procure rails for repairs on the Intercolonial. We cannot, of course, consistently commandeer such rails for the Valley Railway. Under these circumstances, you should advise the Minister of Railways of our inability to complete the St. John Valley Railway within the time specified, and give your reasons therefor.

Yours truly,

(Sgd.) F. P. GUTELIUS.

Moncton, N. B., April 2, 1917.

F. W. Sumner, Esq., Moncton, N. B.

Dear Sir: Your letter of March 24th, with reference to rails for the St. John and Quebec Railway between Gagetown and Westfield.

The three hundred miles of rails which we are sending to France, robs these railways of all available rails, so that it will not be possible for us to supply you with rails until we receive a supply of new rails for the Intercolonial, which will be late in the fall. I do not think you can depend on getting any rails from us this year.

Yours truly,

(Sgd.) F. P. GUTELIUS.

In order to make sure of obtaining the balance of rails required for the Gagetown-Westfield section before the C. G. Railways might be able to supply them under their agreement, when the Legislature met in May last an Act was passed enabling this Company to take up the rails of the Northern Seaboard Line, which have not been in use for some years and will not be required till after the close of the war, at which time they can be replaced by rails which the C. G. Railways will then be able to supply under their agreement. As it became quite evident early in the season that, owing to the difficulties the contractors were experiencing in the way of securing and retaining laborers, they would not be able to complete tracklaying during the season of 1917, and as it was felt desirable to exhaust all reasonable possibilities of obtaining rails in some way other than taking these rails, the matter was postponed

for the season. A little later the Imperial Munitions Board gave the steel mills permission to roll fifty thousand tons of standard rails for the pressing needs of the different railway systems of Canada. The Chief Engineer went to Ottawa in July and asked the Minister to see if he could possibly induce the Munitions Board to allow the rolling of a small additional tonnage sufficient to allow the C. G. Railways to release an amount of relays to complete our requirements. This the Minister promised to do but said he did not think it would be possible, which proved to be correct. At the same time the Chief Engineer asked the Minister if, failing to get the rails rolled, this Company would be permitted to lay rails lighter than the required standard, the same to be replaced by standard rails later when it would be possible for the C. G. Railways to supply them. To this request he readily assented but it was found that the only place where such lighter rails could be obtained was in the interior of the United States at a long distance from here, and the price demanded was so high that when freight and duty had been added it made the cost practically prohibitive. A few standard rails were purchased in Canada and a few lighter rails which can be used in sidings. This brings the history of the rail situation down to the present. On the 29th of January last at the interview which the Secretary and Chief Engineer had with Mr. Bell, Assistant to the Minister of Railways at Ottawa, he stated that it is simply impossible to obtain any new rails in Canada while the war lasts and that the only rails in sight are a quantity of 67-pound rails rolled for the Russian Government in the United States, that there is no certainty of getting these and if so we would have to pay a big price which with freight and duty added would as stated before regarding American relays, make the cost prohibitive, and in addition to this they would have to be replaced later by Standard rails. In view of all this the Board were forced to the conclusion that there is no possible alternative but to take the rails on the Northern Seaboard, and an agreement is to be made with the Northern Seaboard Company for the removal, use, and later the replacement of these rails.

Nearly as soon as this agreement had been arranged, the Department of Railways at Ottawa requested that we turn these rails over for use on the main line of the Canadian Government Railways under heavy, fast traffic and accept either a lighter

new rail or a partially worn relay rail of the same weight. With a view to still further aiding the Dominion Government in this respect the Board offered to turn over all the rails on this line which are practically new and take the same weight of relays, an offer which was gladly accepted. It was also agreed that the price to be allowed for Saint John and Quebec rails is to be \$51.50 per ton plus the cost of freight from New York to Fredericton, and that the price this Board is to pay for 80 pound relays is to be \$35 per ton delivered at Gagetown or St. John.

The location of this section of the road was made in such haste that it was simply impossible to get the best line in detail, but the location at Woodman's Point was plainly a blunder if it was the voluntary choice of the Engineer, and worse if the choice was beyond his control. There is no apparent ground on which this location can be successfully defended as compared with an easy surface line round the hill. So far as damage is concerned this terrible gash through the hill at a maximum depth of nearly 70 ft. and a width of from 100 to 150 feet destroys a lot of property and disfigures the whole section. So far as economy in construction is concerned, if only the railway was to be considered then a structure consisting of piles driven to low water and on them a hard pine trestle of the heaviest type, would have been so cheap in comparison that the interest on the money saved in embankment and bridges would renew the structure above low water every five or six years, and the work would not have been held up at all.

But considering the advisability of building the highway in connection with the railway, and if it had been possible to confine the excavation to the theoretical sections, it would have cost many thousands more than to have made the fill across the Nerepis by train-hauled gravel from the Devil's Back with rip-rap protection, and considering the impossibility of confining the quantities to the theoretical sections, together with the desirability of having more than the usual bottom width in a cut of this length and depth, and with the snow conditions of this country to deal with, it will cost at least seventy thousand dollars more than train hauled gravel and rip-rap, and if ordinary over-haul had been allowed the difference

would have been at least ninety thousand dollars, but the only item which belongs entirely to the poor sub-contractor who does the work, is the overhaul and payment of this is made impossible by a special clause in the contract cutting the item of overhaul out of this particular piece of work. So far as can be discovered the only people who have received any benefit from the misplacing of the line there are a few summer residents who have escaped a trifling annoyance at the expense of their less fortunate neighbors.

Appended hereto is a statement of the work done on the first of May and the estimate to complete, also same at the close of the calendar year. Also a statement showing the total number of right-of-way claims; the number of deeds received to May 1st, 1917; the additional number of deeds received to date; the number of settlements made but deeds not yet received; the number of owners who have signed specific agreements which the Board propose to enforce; and the number where no settlement has been reached.

All of which is respectfully submitted.

C. O. FOSS,
Chief Engineer.

Fredericton, N. B.,
March 15th, 1918.

Statement of Cost of District "A," Gagetown to Westfield, 37.94 Miles, to May 1, 1917.

Account.	Estimated cost to		
	Estimated cost	Cost to date	complete
1. Right of Way and Station			
Grounds	\$117,741.09	\$113,133.33	\$ 4,607.76
2. Clearing and grubbing	11,852.06	10,495.19	1,356.87
3. Grading (including highway and stream diversions ..	907,265.05	501,386.03	405,879.02
4. Rip-rap	74,701.50	16,721.75	57,979.80
5. Bridges superstructure	46,095.00		
Substructure	68,436.00	91,406.80	76,442.20
Foundations	53,318.00		
6. Pipes	13,876.85	12,171.80	1,705.05
7. Culverts	28,528.37	23,652.32	4,876.05
8. Ties	57,500.00	10,833.45	46,666.55
9. Switch ties	3,207.57	.....	3,207.57

10. Rails	160,650.00	32,066.58	128,583.42
11. Switches, frogs, etc.	3,797.20	2,444.24	1,352.96
12. Track fastenings	30,536.64	21,772.08	8,764.56
13. Tie plates	28,350.00	213.75	28,136.25
14. Ballast	51,000.00	2,755.88	48,244.12
15. Tracklaying	20,175.00	.....	20,175.00
16. Fencing	25,724.00	6,901.93	18,822.07
17. Crossings and signs	13,876.80	3,462.29	10,414.51
18. Telegraph lines	9,500.00	388.82	9,111.18
19. Station buildings	15,100.00	78.65	15,021.35
20. Water stations	15,000.00	700.74	14,299.26
21. Miscellaneous structures	1,662.83	947.90	714.93
22. Printing and stationery	1,000.00	708.14	291.86
23. General expenses	40,000.00	30,078.65	9,921.35
24. Engineering	55,000.00	47,936.71	7,063.29
25. Legal expenses	5,000.00	2,308.15	2,691.85
26. Extra work to date, not including bridge accounts	3,999.10	Included in other items	
Totals	\$1,862,893.06	\$934,679.88	\$928,213.18

**Statement of Cost of District "A," Gagetown to Westfield, to
December 31, 1917, 37.94 Miles.**

Account	Estimated cost	Cost to date	Cost to complete
1. Right of Way and Station Grounds.. . . .	\$135,600.53	\$ 115,600.53	\$ 20,000.00
3. Clearing and Grubbing	12,058.76	11,336.26	722.50
4. Grading	1,198,025.68	1,019,645.68	178,380.00
5. Rip-rap	120,752.78	50,752.78	70,000.00
7. Pipes	18,412.64	16,412.64	2,000.00
8. Culverts	32,500.66	29,277.66	3,223.00
9. Bridges	372,657.34	261,017.34	111,550.00
10. Engineering	75,136.63	65,136.63	10,000.00
11. Tracklaying	20,250.00	3,000.00	17,250.00
12. Ballasting	64,253.13	9,002.13	55,250.00
13. Ties	59,299.39	37,671.39	21,628.00
14. Fencing	26,547.18	20,243.18	6,304.00
15. Rails	138,646.23	40,208.73	98,437.50
16. Frogs and Switches	3,587.44	3,587.44	.....
17. Sidings and Terminals	170.00	170.00	.....
18. Crossings and Signs	14,612.90	8,572.80	6,040.11

20. Telegraph Lines	9,906.32	5,656.32	4,250.00
21. Station Buildings	12,600.00	.....	12,600.00
22. Shops, Roundhouses	707.15	707.15	.....
23. Water Stations	14,203.19	9,203.19	5,000.00
24. Fuel Stations	7.78	7.78	.....
25. Miscellaneous Structures	5,947.90	947.90	5,000.00
26. Legal Expenses	2,313.15	2,313.15	.....
27. Interest and Discount	1,460.11	1,460.00	.....
28. General Expenses	52,118.52	42,118.52	10,000.00
29. Printing and Stationery	1,007.50	1,007.50	.....
30. Fastenings	27,917.63	23,696.63	4,221.00
31. Taxes	8.10	8.10

Totals	\$2,420,708.64	\$1,778,852.54	\$641,856.10
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Chief Engineer's Office,

Fredericton, February 12, 1918.

District "A"—Statement of Right of Way Claims to Date.

Total number of Claims.. ..	276
Deeds received prior to May 1st, 1917	182
Deeds received after May 1st, 1917, to date	41
Claims settled, but deeds not yet received	25
Claims where owners have signed specific agreements and which the Board proposes to enforce	15
Claims where no settlement has been reached	13
Total	276

